DEATH OF THE OBSERVER IN ODTOE: DEACTUALISATION, WORLD LINE AND CONDITIONS FOR IMMORTALITY

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ABSTRACT

Within the Observer-Dependent Theory of Everything (ODTOE) [1], the phenomenon of observer death is investigated. Death is shown to be not annihilation but deactualisation: the observation operator $\hat{O}$ ceases to project configurations from $\mathcal{H}$ into $\mathcal{C}$, yet the observer's world line $W = \{\Psi_n^*\}_{n\in\mathbb{Z}}$ persists in the space of potential states as a single inseparable object [2]. Four phases of dying are formalised through sequential zeroing of cognitive coherence components $B = F \cdot E \cdot (1-\sigma) \cdot \Lambda$ [1]: loss of focus ($F \to 0$), emotional decoherence ($E \to 0$), zeroing of experience ($\Lambda \to 0$), maximal internal contradiction ($\sigma \to 1$). The concept of coherent legacy $\mathcal{L}(O)$ is introduced — the aggregate of artefacts through which a deactualised observer continues to influence collective S. From the configuration lifetime formula $T(C) = T_0/(1-S)^n$ [1], three conditions are derived under which an observer's influence survives biological death: high artefact coherence ($S_A \to 1$), growing number of successors ($n_{\text{succ}} \to \infty$), and self-consistency of the world line with the fixed point Ψ^*. It is shown that the commandment "love thy neighbour as thyself" [3] constitutes the sole condition under which $T(\mathcal{L}) \to \infty$ — coherent immortality. Parallels with Buddhist, Christian, and Stoic philosophies of death are discussed, along with near-death experiences (NDE), digital legacy, and experimentally testable predictions.

Keywords: death, observer, deactualisation, world line, coherent legacy, immortality, artefact, coherence, near-death experience, digital legacy, ODTOE.

I. INTRODUCTION: WHY PHYSICS IS SILENT ABOUT DEATH

Physics describes the decay of atoms, the collapse of stars, the heat death of the Universe — but not the death of the observer. In the standard formalism the observer is an external agent who does not enter the equations. Its appearance and disappearance

are not described by the theory. Quantum mechanics postulates the collapse of the wave function upon measurement but does not formalise what happens when the measurer ceases to exist [13].

Classical thermodynamics describes death as entropy growth in an open system: the organism loses the ability to maintain the negative entropy necessary for life [16]. However, thermodynamics says nothing about the subjective experience of dying, about what happens to the observer's "first person." This lacuna is not accidental — it is a consequence of the fundamental decision made by seventeenth-century physics: to place the observer outside the brackets of the equations.

ODTOE eliminates this gap. The observer is not an external commentator but a *constitutive element* of reality: $R = \hat{O}(\Psi)$ [1]. Its disappearance is not "switching off the camera" but a *structural event* that changes the configuration of reality for all connected observers. When the operator $\hat{O}$ ceases to act, it is not only the state of one individual that changes — the entire structure of collective coherence S, in which that individual was embedded, changes as well.

This fundamentally distinguishes the ODTOE approach from the two dominant paradigms. Materialism asserts: death is the complete annihilation of the subject, after which nothing remains. Religious dualism asserts: death is the transition of the "soul" to another mode of being. ODTOE offers a third way: death is deactualisation, in which the operator $\hat{O}$ ceases to project configurations, but the world line W is preserved in $\mathcal{H}$ as a mathematical object, and the coherent legacy $\mathcal{L}(O)$ continues to influence the collective configuration.

The questions posed by the present paper: What happens when $\hat{O}$ ceases to act? Is the observer annihilated? Does information about the observer disappear? Can one formalise the conditions under which the observer's influence continues after biological death? Are there experimentally testable consequences of this model?

II. FOUR PHASES OF DEACTUALISATION

II.1. Death as $B \to 0$

The cognitive coherence of the observer [1]:

$$B(O, C) = F^{w_1} \cdot E^{w_2} \cdot (1 - \sigma)^{w_3} \cdot \Lambda^{w_4} \tag{D1.1}$$

The formula is multiplicative: zeroing any factor zeroes the entire result. Biological death is a process of sequential zeroing of all four components. The order may vary, but the structure is universal. The multiplicativity of the formula reflects a fundamental property of consciousness: it is not the sum of independent parts but the product of interdependent factors. The loss of any single factor destroys the whole — just as a product becomes zero when any factor is zeroed.

It is important to emphasise that zeroing of B does not mean instantaneous disappearance. The process of deactualisation unfolds in time and passes through characteristic phases, each of which has neurophysiological correlates and subjective

manifestations. Let us consider these phases in detail.

The rate of deactualisation can be described by a differential equation. If we introduce a generalised degradation parameter τ, then:

$$\frac{dB}{d\tau} = B\left(\frac{w_1}{F}\frac{dF}{d\tau} + \frac{w_2}{E}\frac{dE}{d\tau} - \frac{w_3}{1-\sigma}\frac{d\sigma}{d\tau} + \frac{w_4}{\Lambda}\frac{d\Lambda}{d\tau}\right) \tag{D1.2}$$

This formula shows that the rate of zeroing of B is proportional to the current value of B and to the sum of the relative degradation rates of each component. At small values of any component, the corresponding term in parentheses dominates, accelerating overall degradation — an effect observed clinically as cascading deterioration in the terminal phase.

II.2. Phase I: Loss of focus ($F \to 0$)

Typically, focus weakens first. Attention disperses. Thoughts lose directionality. Clinically this manifests as confusion, delirium, loss of orientation. Neurophysiologically: decreased activity of the dorsal attention network (DAN), degradation of the EEG gamma rhythm [4]. Research by Lazar et al. showed that grey-matter density in the prefrontal cortex — the key neuroanatomical substrate of focus — declines with ageing and especially sharply in neurodegenerative diseases [4].

In ODTOE: the operator $\hat{O}$ loses its "aim" — it projects configurations chaotically, without a stable direction. Observation becomes blurred. Formally this is described as an increase in the variance of the projection operator:

$$\mathrm{Var}[\hat{O}(\Psi)] = \frac{\sigma_0^2}{F^2} \to \infty \quad \text{as} \quad F \to 0 \tag{D2.1}$$

An observer who has lost focus projects an ever-wider spectrum of configurations, unable to concentrate on any one of them. Subjectively this is experienced as "dissolving" of reality, an inability to hold a thought, loss of the "here and now." Clinically it is precisely this phase that most often first attracts the attention of others — the person "no longer recognises where they are."

II.3. Phase II: Emotional decoherence ($E \to 0$)

The emotional system becomes misaligned with intention. The person ceases to feel a connection with what they do and what they want. Heart-rate variability (HRV) drops — an objective marker of decreasing E [5]. Clinically: apathy, indifference, emotional "flattening." McCraty and Zayas showed that HRV is a reliable biomarker of emotional coherence — the ability of the emotional system to synchronise with cognitive processes [5].

In ODTOE: the quaternionic axis $E\mathbf{j}$ is zeroed [6]. The observer loses the "rotation amplitude" — the ability to resonate emotionally with a configuration. If the observer's

state is represented as a quaternion $q = \Lambda + F\mathbf{i} + E\mathbf{j} + \sigma\mathbf{k}$ [6], then zeroing the E-component means losing one of the three spatial dimensions of the observer's "inner space."

Emotional decoherence is particularly vivid in terminal stages: patients often display so-called "emotional indifference" — the inability to experience joy, grief, or fear. This is not "peace" — it is the loss of one of the fundamental channels of connection with reality.

II.4. Phase III: Devaluation of experience ($\Lambda \to 0$)

Accumulated experience ceases to be perceived as a resource. The past loses meaning. The person does not recognise loved ones, does not remember their own history. Neurophysiologically: hippocampal degeneration [7]. The work of Braak and Braak demonstrated the staged nature of neuropathological changes in Alzheimer's disease: degradation begins in the entorhinal cortex and hippocampus — structures responsible for memory consolidation — and gradually spreads to the neocortex [7].

In ODTOE: the scalar part of the quaternion Λ (the real component, the observer's "grounding") is zeroed. The operator loses its "anchor" — the reference point in configuration space. Without experience ($\Lambda = 0$) the observer cannot distinguish configurations: all projections $\hat{O}(\Psi)$ become equivalent, devoid of context and historical depth.

The loss of Λ is especially tragic because it destroys the *continuity* of the world line in the observer's subjective perception. Although objectively the world line $W = \{\Psi_n^*\}$ continues to exist in $\mathcal{H}$, subjectively the observer loses access to their own past iterations. Each moment becomes isolated, unconnected with previous ones.

II.5. Phase IV: Maximal contradiction ($\sigma \to 1$)

Internal processes are completely desynchronised. The heart contracts but the blood does not deliver oxygen. Neurons fire but without coordination. Biochemical cascades contradict one another.

In ODTOE: $(1 - \sigma) \to 0$. The integrity factor is zeroed. The observer "comes apart" — much as a star comes apart during tidal disruption by a black hole [8]. The analogy is not accidental: in both cases the internal binding forces (gravitational for the star, coherent for the observer) prove insufficient to maintain the object's integrity.

Formally, the growth of σ is described through an increase in the measure of internal inconsistency. If the observer's state is regarded as a set of subsystems $\{s_1, s_2, \ldots, s_m\}$, then:

$$\sigma = 1 - \frac{2}{m(m-1)} \sum_{i<j} \cos\theta_{ij} \tag{D2.2}$$

where θ_{ij} is the "misalignment angle" between subsystems s_i and s_j. At full alignment ($\theta_{ij} = 0$ for all pairs) $\sigma = 0$. At complete chaos ($\cos\theta_{ij}$ random) $\sigma \to 1$.

II.6. The moment of death: $B = 0$

$$B = F^{w_1} \cdot E^{w_2} \cdot (1-\sigma)^{w_3} \cdot \Lambda^{w_4} = 0 \tag{D2.3}$$

The operator $\hat{O}$ ceases to project configurations. The self-observation cycle $\Phi = \iota \circ \hat{O}$ *breaks* on the $\hat{O}$ side: the reverse injection ι continues to operate (the body decomposes, atoms return to the environment), but direct actualisation does not.

The moment $B = 0$ can be interpreted as a phase transition: the observer passes from the "actualised" state (an active participant in the configuration $\mathcal{C}$) to the "deactualised" state (an element of the space $\mathcal{H}$ without active projection). This is not annihilation — it is a change of ontological status.

It is essential that the transition $B \to 0$ is irreversible from the standpoint of the biological observer: the once-lost ability to project configurations does not recover spontaneously. However, the world line W is not "erased" from $\mathcal{H}$ — and this opens the possibility for coherent legacy, which we consider below.

III. WHAT REMAINS: THE WORLD LINE IN $\mathcal{H}$

III.1. The world line is not destroyed

In [2] the observer's world line is defined:

$$W = \{\Psi_n^*\}_{n\in\mathbb{Z}}, \quad \Psi_{n+1}^* = \Phi(\Psi_n^*) + \delta\Psi_n \tag{D3.1}$$

The world line is a *single object* in $\mathcal{H}$. It contains all iterations of the observer's life: from the first cry to the last breath. "Past" and "future" are cross-sections of W, not lost or non-existent fragments [2].

Biological death means: the final iteration Ψ_N^* is fixed; no new iterations $\Psi_{N+1}^*, \Psi_{N+2}^*, \ldots$ are generated (the operator $\hat{O}$ has ceased working). But the line itself $W = \{\Psi_0^*, \Psi_1^*, \ldots, \Psi_N^*\}$ is *not deleted* from $\mathcal{H}$. It exists there in the same way that the Pythagorean theorem exists in mathematics — regardless of whether anyone is thinking about it right now.

To substantiate this thesis we introduce the concept of the *informational measure* of a world line. We define the informational content of W as:

$$I(W) = \sum_{n=0}^{N} H(\Psi_n^*) + \sum_{n=0}^{N-1} I(\Psi_n^*; \Psi_{n+1}^*) \tag{D3.2}$$

where $H(\Psi_n^*)$ is the entropy (informational content) of the n-th iteration, and $I(\Psi_n^*; \Psi_{n+1}^*)$ is the mutual information between adjacent iterations. The quantity $I(W)$ is finite and positive for any completed world line. Deactualisation ($B \to 0$) ceases the generation of new terms in the series but does not diminish $I(W)$ — information is not destroyed.

This is consistent with the principle of information conservation discussed in the context of the black-hole information paradox [19]: information that has entered a black hole is not destroyed but preserved in correlations. Analogously, the information of the observer's world line is preserved in the structure of $\mathcal{H}$ — in correlations between iterations and in connections with the world lines of other observers.

III.2. The book analogy

An author wrote a book and died. The book is a coherent artefact [3] with a lifetime:

$$T(A) = \frac{T_0}{(1 - S_A)^{n_{\text{read}}}} \tag{D3.3}$$

The author is dead ($B_{\text{author}} = 0$), but the artefact is alive ($S_A > 0$, $n_{\text{read}} > 0$). Each new reader increases n_{read}, extending $T(A)$. Homer's *Iliad*: the author has been dead for 2800 years, the artefact is alive, $T(A) \gg T_{\text{biol}}$.

The world line of the author W_{Homer} in $\mathcal{H}$ continues to *resonate* with the world lines of readers: everyone who reads the *Iliad* actualises a cross-section of W_{Homer} through their own operator $\hat{O}_{\text{reader}}$.

This allows us to introduce the concept of *resonance coupling* between world lines. Let W_1 be the author's world line, W_2 the reader's world line. Then the act of reading creates a correlation:

$$\rho(W_1, W_2) = \frac{\langle W_1 | W_2 \rangle}{\|W_1\| \cdot \|W_2\|} \tag{D3.4}$$

where the inner product $\langle W_1 | W_2 \rangle$ is defined through the intersection of the configuration spaces of the two observers. The deeper the reader "enters" the text, the greater $\rho(W_1, W_2)$ — the stronger the resonance coupling.

III.3. The coherent-legacy formula

We define the coherent legacy of observer O as the aggregate of artefacts through which the observer's world line continues to influence collective coherence:

$$\mathcal{L}(O) = \{A_1, A_2, \ldots, A_k\}, \quad T(\mathcal{L}) = \max_i T(A_i) \tag{D3.5}$$

The lifetime of the legacy is determined by the *most coherent* artefact. Socrates wrote no books — but his student Plato created artefacts (the S_A of Plato's dialogues is extraordinarily high) through which the world line W_{Socrates} has been actualised for 2400 years.

Note that the formula uses max, not $\sum$ — this is fundamental. Legacy is determined by the quality of the best artefact, not by the quantity of mediocre ones. A single self-consistent text (Euclid's *Elements*, the Bible, Newton's *Principia*) is worth more than a thousand internally contradictory works.

The total "power" of a coherent legacy can be described more fully through the aggregate contribution of all artefacts:

$$P(\mathcal{L}) = \sum_{i=1}^{k} S_{A_i} \cdot n_{\text{read},i} \tag{D3.6}$$

This quantity characterises the total influence of a deactualised observer on collective coherence. A high $P(\mathcal{L})$ means that the observer, although deactualised, continues to be a significant element of the collective configuration.

IV. THREE CONDITIONS FOR IMMORTALITY

IV.1. Condition 1: Artefact coherence ($S_A \to 1$)

An artefact with $S_A = 0$ (internally contradictory, incoherent) has $T(A) = T_0$ — the minimum lifetime. An artefact with $S_A \to 1$ (self-consistent, non-contradictory) has $T(A) \to \infty$.

Mathematical formulae are artefacts with $S_A \to 1$: the Pythagorean theorem, Euler's identity, the formula $R = \hat{O}(\Psi)$ — are self-consistent and context-independent. Their lifetime is unbounded.

A political manifesto is an artefact with $S_A < 1$ (context-dependent, loses coherence when the epoch changes). Fashion is an artefact with $S_A \ll 1$ (coherent only within a narrow temporal window).

One can introduce a coherence spectrum of artefacts. Arranging typical artefacts by their S_A value:

$$S_A^{\text{fashion}} \ll S_A^{\text{polit}} < S_A^{\text{lit}} < S_A^{\text{philos}} < S_A^{\text{math}} \to 1 \tag{D4.1}$$

This hierarchy explains why fashion trends live for a season, political slogans for decades, literary works for centuries, philosophical systems for millennia, and mathematical theorems forever. Each level differs in the degree of context-independence: the less an artefact is tied to a specific epoch, culture, or language, the higher its S_A.

IV.2. Condition 2: Growth of the number of successors ($n_{\text{succ}} \to \infty$)

By formula (D3.3): at fixed S_A, the growth of n_{read} increases $T(A)$ in a power-law fashion. An artefact that *generates* new observers (a textbook that inspires students to create their own artefacts) creates a *chain reaction of coherence*:

$$n_{\text{read}}(t) = n_0 \cdot e^{\gamma t} \quad \Rightarrow \quad T(\mathcal{L}) \to \infty \tag{D4.2}$$

where γ is the "contagiousness" coefficient of the artefact, characterising the rate of exponential audience growth. For most artefacts $\gamma < 0$ (the audience shrinks) and the legacy fades. For outstanding works $\gamma \approx 0$ (a stable audience) or $\gamma > 0$ (a growing audience).

The condition $\gamma > 0$ is equivalent to the artefact being *generative*: it inspires the creation of new artefacts, which in turn attract new readers. Euclid's *Elements* spawned the entire tradition of axiomatic mathematics — an infinite chain of artefacts with $\gamma > 0$.

Let us derive the condition for legacy immortality more rigorously. Substituting exponential growth into formula (D3.3):

$$T(A) = \frac{T_0}{(1 - S_A)^{n_0 e^{\gamma t}}} \tag{D4.3}$$

When $S_A > 0$ and $\gamma > 0$ the exponent grows without bound, making the denominator infinitesimally small, and $T(A) \to \infty$. This is the mathematical expression of coherent immortality.

IV.3. Condition 3: Self-consistency with Ψ^*

The fixed point $\Psi^* = \Phi(\Psi^*)$ [1] is the configuration that reproduces itself under self-observation. If the observer's world line W approaches Ψ^*, its stability is maximal: it does not depend on external conditions and is reproducible by any observer capable of executing the cycle Φ.

Practically: an observer whose life is aligned with fundamental principles (rather than with fashion, ideology, or majority opinion) creates a world line approaching Ψ^*. Their legacy is robust to changes of epoch.

The degree of approach to Ψ^* can be measured by the distance in $\mathcal{H}$:

$$d(W, \Psi^*) = \min_n \|\Psi_n^* - \Psi^*\| \tag{D4.4}$$

The smaller $d(W, \Psi^*)$, the more stable the observer's legacy. Observers whose world lines approached Ψ^* created artefacts of universal significance. The "Golden Rule" principle (encountered independently in dozens of cultures [20]) is an example of such an approach: it is self-consistent and reproducible by any reflective observer.

V. DEATH AND THE COLLECTIVE OBSERVER

V.1. Death as an event in collective coherence

For a collective observer of n participants the coherence [1]:

$$S = 1 - \frac{2}{n(n-1)} \sum_{i<j} |B_i - B_j| \tag{D5.1}$$

The death of one observer ($B_i \to 0$) affects S in two ways:

1. n **decreases** — fewer participants, fewer pairs.
2. $|B_i - B_j|$ **increases** for all pairs involving the deceased — their $B = 0$ diverges maximally from the living ($B_j > 0$).

However, through the coherent legacy $\mathcal{L}$ the influence of the deceased is *not zeroed*. If the legacy is coherent ($S_{\mathcal{L}} > 0$), it continues to contribute to collective S — effectively as a "virtual observer" with $B_{\mathcal{L}} = S_{\mathcal{L}}$.

We introduce a formula for the modified collective coherence that accounts for the legacy:

$$S' = 1 - \frac{2}{(n+k)(n+k-1)} \left(\sum_{i<j} |B_i - B_j| + \sum_{i=1}^{n} \sum_{l=1}^{k} |B_i - S_{\mathcal{L}_l}| \right) \tag{D5.2}$$

where k is the number of deactualised observers with non-zero legacy and $S_{\mathcal{L}_l}$ is the coherence of the l-th deactualised observer's legacy. Formula (D5.2) shows that deactualised observers with highly coherent legacies continue to "be present" in the collective configuration.

V.2. Grief as decoherence

The death of a loved one sharply reduces the S of the family (a collective observer). Subjectively this is experienced as grief — a sudden loss of coherence, the feeling that "the world has fallen apart." In formulae: $|B_i - B_{\text{deceased}}|$ jumps for all i, S drops, the lifetime of the family configuration $T(C_{\text{family}})$ contracts.

The process of grieving is a *reconfiguration* of the collective observer: the gradual construction of a new S without the deceased but incorporating their legacy $\mathcal{L}$. When $\mathcal{L}$ is integrated into the collective configuration, S recovers — but at a different level.

The Kübler-Ross model describes five stages of grief: denial, anger, bargaining, depression, acceptance [17]. In ODTOE terms these stages correspond to successive attempts by the collective observer to reconstruct S:

1. **Denial** — an attempt to keep S unchanged by ignoring $B_{\text{deceased}} = 0$. Inconsistency grows.
2. **Anger** — a sharp increase in σ among the survivors. Internal contradiction intensifies.
3. **Bargaining** — an attempt to find a configuration in which $B_{\text{deceased}} \neq 0$. Unsuccessful for biological death.

4. **Depression** — the minimum of S and B_i among the survivors. Collective coherence is at its nadir.

5. **Acceptance** — integration of $\mathcal{L}$ into a new configuration. S recovers at a new level.

V.3. Memorial rituals as maintenance of $S_{\mathcal{L}}$

Memorial rituals, days of remembrance, visits to graves are mechanisms of *reactualisation* of the deceased's world line W through the collective operator $\hat{O}_{\text{coll}}$. Every act of remembrance is $\hat{O}_{\text{coll}}(\Psi^*_W)$: a projection of a cross-section of the deceased's world line into the current configuration $\mathcal{C}$. The ritual maintains n_{read} for the legacy's artefacts, preventing degradation of $T(\mathcal{L})$.

The frequency of memorial rituals sets a lower bound on maintaining n_{read}. If rituals cease, $n_{\text{read}} \to 0$, and even at high S_A the artefact's lifetime becomes finite. This explains the universality of memorial traditions across all cultures — they are a mechanism for maintaining coherent legacy, developed evolutionarily.

VI. NEAR-DEATH EXPERIENCE (NDE) IN ODTOE

VI.1. Phenomenology of near-death experience

Near-death experiences (NDE) are described as "a review of one's entire life," "leaving the body," "light at the end of a tunnel," encounters with deceased relatives [12]. Van Lommel et al., in a prospective study of cardiac-arrest survivors, showed that NDEs occur in 18% of patients and possess a stable phenomenological structure independent of culture, age, and religious beliefs [12].

In ODTOE near-death experience receives a formal description. As $B \to 0$, the stochastic noise $D(\eta) = D_0(1 - S)$ at the individual level is maximal [1], but *for an instant* before complete zeroing a stochastic spike is possible — a brief expansion of Δn granting access to cross-sections of the world line normally inaccessible.

VI.2. "Life review" as unfolding of the world line

"Life review" — one of the most commonly reported experiences during NDE — is described as the simultaneous actualisation of many Ψ^*_n at $\Delta n \gg 1$. In the normal state the observer "sees" only the current cross-section Ψ^*_n with a narrow window $\Delta n \sim 1$. As $B \to 0$ the normal constraints on Δn weaken:

$$\Delta n_{\text{NDE}} = \frac{\Delta n_0}{B^\alpha}, \quad \alpha > 0 \tag{D6.1}$$

As $B \to 0$ the window $\Delta n_{\text{NDE}} \to \infty$ — the observer gains instantaneous access to the entire world line W. Subjectively this is experienced as "my whole life flashed before

my eyes."

VI.3. "Light at the end of the tunnel" and the fixed point

The experience of "bright light" and a "tunnel" can be interpreted as approach to the fixed point Ψ^*. As $B \to 0$ the observer's world line is "released" from particular configurations and, in the limit, tends toward the attractor Ψ^* — the configuration that reproduces itself under self-observation. "Light" is the subjective experience of maximal coherence $S \to 1$ in the vicinity of Ψ^*.

Return from an NDE (B recovers upon successful resuscitation) is often accompanied by deep personal transformation: reduced fear of death, increased empathy, re-evaluation of values [12]. In ODTOE terms: the brief contact with Ψ^* restructures the observer's world line, reducing σ and increasing E.

VII. DIGITAL LEGACY AND ITS RELATION TO COHERENT LEGACY

VII.1. Digital artefacts as elements of $\mathcal{L}(O)$

In the modern era, an observer leaves behind not only physical artefacts (books, buildings, works of art) but also digital ones: social-media posts, e-mails, digital photographs, software code, profiles on internet platforms. The totality of digital artefacts forms the *digital legacy* $\mathcal{L}_{\text{digit}}(O) \subset \mathcal{L}(O)$.

Digital artefacts possess special properties from the standpoint of formula (D3.3):

1. **Low replication cost.** Copying a digital artefact is practically free, which potentially increases n_{read}.
2. **Fragility of the medium.** Digital formats become obsolete, servers are shut down, companies close. Without active maintenance $n_{\text{read}} \to 0$ faster than for physical artefacts.
3. **Low coherence.** Most digital artefacts (social-media posts, comments) have $S_A \approx 0$ — they are context-dependent, fragmentary, and internally unconnected.

VII.2. The paradox of digital abundance

A paradox arises: the modern observer leaves quantitatively more artefacts than any predecessor, yet qualitatively (by S_A) most of them are negligible. The aggregate power of the digital legacy:

$$P(\mathcal{L}_{\text{digit}}) = \sum_i S_{A_i} \cdot n_{\text{read},i} \approx 0 \cdot n_{\text{large}} = 0 \tag{D7.1}$$

Thousands of posts with $S_A \approx 0$ yield zero legacy, whereas a single deeply thought-out work with $S_A \to 1$ can ensure $T(\mathcal{L}) \to \infty$.

This leads to a practical conclusion: for the creation of a significant legacy it is not the quantity of digital traces that matters but the coherence of the artefacts created. A single self-consistent text is worth more than a million fragmentary publications.

VII.3. Digital "resurrections" and their limitations

Modern technologies make it possible to create digital models of deceased people based on their digital legacy — chatbots, deepfakes, virtual avatars [22]. In ODTOE terms these models are *synthetic artefacts* A_{synth} that imitate cross-sections of the world line W of a deactualised observer.

However, A_{synth} differs fundamentally from genuine legacy $\mathcal{L}(O)$: the model reproduces surface patterns (speech style, thematic preferences) but does not reproduce the deep coherence of the world line. The coherence of a synthetic artefact:

$$S_{A_{\text{synth}}} \leq S_{A_{\text{genuine}}} \cdot \rho(\text{model}, W) \tag{D7.2}$$

where $\rho(\text{model}, W)$ is the fidelity coefficient of the model relative to the genuine world line. At the current level of technology $\rho \ll 1$, making digital "resurrections" a pale imitation of coherent legacy.

VIII. PARALLELS WITH PHILOSOPHICAL TRADITIONS

VIII.1. Buddhism: anatman and the stream

The Buddhist concept of anatman (not-self) asserts: there is no unchanging "soul"; there is a stream of dharmas (elementary states) that ceases at nirvana [9]. In ODTOE: there is no fixed "self" — there is a world line W composed of iterations Ψ_n^*. Death is the cessation of generation of new iterations. Nirvana is the attainment of Ψ^* (the fixed point), at which the stream stabilises.

The structural correspondence runs deeper than a simple analogy. The Buddhist concept of the "skandhas" (five aggregates of existence: form, sensation, perception, volitional acts, consciousness) finds a parallel in the four components of coherence B: Λ (form/experience), E (sensation), F (perception/focus), $(1-\sigma)$ (integrity of volitional acts). The zeroing of each skandha at death is the analogue of zeroing the corresponding component of B.

Buddhist meditation practice aims at achieving *vipassana* — "seeing as it is." In ODTOE terms vipassana means increasing focus F while simultaneously reducing σ: the meditating observer projects configurations with maximal accuracy and minimal internal contradiction. This raises B during life and the S_A of artefacts created by such an observer.

The concept of the "bodhisattva" — a being who renounces nirvana for the sake of saving all living beings — corresponds to the strategy of maximising n_{succ}: the bodhisattva strives to increase the number of observers capable of reaching Ψ^*, which is equivalent to the condition $\gamma > 0$ in formula (D4.2).

VIII.2. Christianity: resurrection and eternal life

Christian doctrine asserts: the body is mortal, the soul is immortal, resurrection is possible [10]. In ODTOE: the body is a configuration $C_{\text{body}} \in \mathcal{C}$ with finite T. The world line $W \in \mathcal{H}$ is not destroyed. "Resurrection" is formalised as reactualisation of W through a coherent artefact: $\hat{O}_{\text{succ}}(\Psi^*_W) = R_{\text{restored}}$. The commandment "love thy neighbour" = the condition $S \to 1$ = the condition $T \to \infty$ [3].

The Christian notion of the "Body of Christ" (the Church as a single organism composed of many members) is a precise analogue of the collective observer in ODTOE. Each believer is an individual observer O_i with coherence B_i; the Church is a collective observer with coherence S. The commandment of love is the condition for maximising S.

Christian eschatology (the doctrine of "last things") describes "universal resurrection" — the reactualisation of *all* world lines. In ODTOE terms this corresponds to a hypothetical state in which the collective operator $\hat{O}_{\text{coll}}$ acquires the ability to actualise any cross-section of any world line from $\mathcal{H}$.

It is noteworthy that the Christian tradition distinguishes "first death" (biological) from "second death" (spiritual, final) [21]. In ODTOE the first death is deactualisation ($B \to 0$); the second is the complete loss of coherent legacy ($T(\mathcal{L}) \to 0$), in which the world line W, though it exists in $\mathcal{H}$, is never reactualised.

VIII.3. Stoicism: memento mori and amor fati

The Stoic practice of "remember death" [11] is aimed at reducing σ: awareness of finitude eliminates false priorities and internal contradictions. "Amor fati" (love of fate) = acceptance of the world line W in its entirety, including its finitude in $\mathcal{C}$ — which raises E and lowers σ, increasing B during life and $S_{\mathcal{L}}$ after death.

Stoic philosophy, developed by Marcus Aurelius, Epictetus, and Seneca [11], contains practical recommendations that in ODTOE terms correspond to a strategy of optimising B:

1. **Dichotomy of control** (distinguishing what does and does not depend on us) — reduction of σ through elimination of internal contradictions generated by the desire to control the uncontrollable.
2. **Negative visualisation** (premeditatio malorum) — increase of Λ through broadening the spectrum of considered configurations, including unfavourable ones.
3. **Evening self-examination** — increase of F through regular reflection on one's own actions and motivations.

4. **Cosmopolitanism** (awareness of being part of the universal whole) — increase of E through broadening the emotional connection with the collective observer.

The Stoic "memento mori" plays a specific role in the context of ODTOE: awareness of the finitude of B (its inevitable zeroing) motivates the observer to create artefacts with maximal S_A, i.e., to invest in coherent legacy. An observer who ignores their own mortality has no incentive to create a legacy — and consequently their influence ceases together with the biological body.

VIII.4. Existentialism: being-toward-death

Heidegger's concept of "being-toward-death" (Sein-zum-Tode) [23] asserts: authentic existence is possible only in the face of awareness of one's own mortality. In ODTOE this receives a precise expression: an observer aware of the finitude of B transitions from "inauthentic" existence (high σ, low F) to "authentic" existence (low σ, high F).

Existential anxiety is the subjective experience of awareness of $B \to 0$ as an inevitable future event. This anxiety, according to Heidegger, is not pathology but a condition of authentic existence. In ODTOE formulae: awareness of $T_{\text{biol}} < \infty$ creates motivation to increase the S_A of artefacts and n_{succ}, i.e., to create a legacy that survives the biological body.

IX. EXPERIMENTALLY TESTABLE PREDICTIONS

IX.1. Coherence before death

Formulae (D1.1) and (D1.2) predict sequential zeroing of the components of B. HRV (E), EEG gamma rhythm (F), memory tests (Λ), cognitive-dissonance scales (σ) should demonstrate *sequential* rather than simultaneous fading. The order of fading may vary, but multiplicativity predicts: zeroing any single component produces a jump-like decline in overall B.

Specific verification protocol: longitudinal measurement of four parameters in terminal patients with a temporal resolution of 1 hour. ODTOE predicts that the correlation between B_{meas} (measured coherence) and the product $F \cdot E \cdot (1-\sigma) \cdot \Lambda$ will be higher than the correlation with the sum $F + E + (1-\sigma) + \Lambda$. The multiplicative model should outperform the additive one.

IX.2. Near-death experience as expansion of Δn

Formula (D6.1) predicts that "life review" during NDE correlates with the depth of clinical death (the degree to which B has decreased). The closer B is to zero, the wider Δn_{NDE} — the more complete the "life review" reported by the patient.

Testable prediction: patients with longer cardiac arrest (given successful resuscitation) should report more complete "life reviews" and more vivid NDE

experiences. Van Lommel's data [12] partially support this hypothesis, but further verification is required.

IX.3. Lifetime of the legacy

Formula (D3.3) predicts a correlation between artefact coherence (S_A) and longevity. Systematic comparison of S_A (assessed by experts for internal consistency) with the actual lifetime of artefacts (books, institutions, laws) would verify the formula.

Specific methodology: a sample of $N > 100$ texts from different epochs; expert assessment of S_A (on a scale from 0 to 1) by a panel of $m \geq 5$ independent experts; actual lifetime T_{actual} (in years of continuous citation or reprinting); testing of the power-law dependence $T_{\text{actual}} \sim (1 - S_A)^{-n}$.

IX.4. Grief and HRV

Prediction: the HRV of surviving family members drops abruptly after the death of a loved one (S_{family} drops $\to E_i$ drops $\to$ HRV drops) and gradually recovers as the legacy $\mathcal{L}$ is integrated into the new collective configuration.

The recovery kinetics should obey the formula:

$$\text{HRV}(t) = \text{HRV}_0 \cdot \left(1 - \Delta e^{-t/\tau_{\text{grief}}}\right) \tag{D9.1}$$

where Δ is the depth of the initial drop (proportional to the role of the deceased in collective S), and τ_{grief} is the characteristic recovery time (inversely proportional to the coherence of the legacy $S_{\mathcal{L}}$). The more coherent the deceased's legacy, the faster the recovery.

IX.5. Coherence of digital legacy

Formula (D7.1) predicts that the number of digital artefacts does not correlate with the longevity of the legacy. Testable prediction: among authors who died in the 21st century, the longevity of cultural influence (number of citations 50 years after death) should correlate not with the volume of digital presence (n_{posts}) but with the maximal coherence of individual artefacts ($\max_i S_{A_i}$).

XII. CONDITIONS FOR ETERNAL LIFE WITHOUT PHYSICAL DEATH

In Sections IV–V we considered *legacy immortality* — conditions under which an observer's influence survives biological death. However, a fundamental question remains: is the immortality of *the observer itself* possible? Under what conditions is

deactualisation ($B \to 0$) preventable, and can an observer — be it an atom, a cell, a human, or a star — continue to project configurations indefinitely?

XII.1. Statement of the problem: when deactualisation is preventable

Until now we have treated deactualisation as an inevitable outcome: $B \to 0$ for every biological observer. But formula (D1.1) contains no *prohibition* on the eternal maintenance of $B > 0$. The multiplicative structure $B = F^{w_1} \cdot E^{w_2} \cdot (1-\sigma)^{w_3} \cdot \Lambda^{w_4}$ admits solutions in which none of the factors is zeroed.

The key distinction: *legacy immortality* (Sections IV–V) is the preservation of traces of a deactualised observer through artefacts; *observer immortality* is the preservation of an active operator $\hat{O}$ that continues to project configurations from $\mathcal{H}$ into $\mathcal{C}$.

Formally the problem is stated as follows: find conditions under which

$$B(t) > B_{\text{crit}} > 0 \quad \text{for all} \quad t \in [0,\, \infty) \tag{XII.0}$$

where B_{crit} is the minimum coherence required to sustain the self-observation cycle $\Phi = \iota \circ \hat{O}$. When $B < B_{\text{crit}}$ the cycle Φ breaks: the operator $\hat{O}$ is unable to project configurations stably, stochastic noise dominates, and deactualisation becomes irreversible.

The central insight: if the coherence growth rate can be maintained at $dB/dt \geq 0$ indefinitely, the observer never deactualises. The question reduces to which physical, biological, and cognitive mechanisms allow (or do not allow) this condition to be met.

XII.2. The thermodynamic constraint and its overcoming

The second law of thermodynamics asserts: the entropy of a closed system does not decrease. All structures degrade. This would appear to make immortality impossible: any observer is an open thermodynamic system, and ultimately the accumulation of entropy will destroy its coherence.

In ODTOE the thermodynamic constraint receives a precise expression through the stochastic-noise formula [1]:

$$D(\eta) = D_0(1 - S) \tag{XII.1}$$

where D_0 is the maximal noise amplitude and S is the observer's coherence. Entropy growth in ODTOE is equivalent to growth of $D(\eta)$, i.e., to a decrease in S. When $S \to 1$, the noise $D(\eta) \to 0$ — the observer is fully coherent and stochastic degradation is suppressed. When $S \to 0$, the noise is maximal: $D(\eta) \to D_0$, and the structure is rapidly destroyed.

The *non-decay* condition consists in the noise not exceeding a critical threshold D_{crit} beyond which degradation becomes irreversible:

$$D(\eta) \leq D_{\text{crit}} \quad \Leftrightarrow \quad D_0(1-S) \leq D_{\text{crit}} \quad \Leftrightarrow \quad S(t) \geq S_{\text{crit}} \quad \text{for all} \quad t \tag{XII.2}$$

We derive the critical coherence threshold:

$$S_{\text{crit}} = 1 - \frac{D_{\text{crit}}}{D_0} \tag{XII.3}$$

The physical meaning of formula (XII.3): the observer must maintain coherence above the critical threshold *permanently*. A drop of S below S_{crit} in even a single time interval triggers a degradation cascade described by equation (D1.2) that with high probability leads to irreversible deactualisation.

Thus, the second law of thermodynamics *does not prohibit* immortality — it merely requires that the observer be an *open system*, continuously compensating entropy growth by the influx of negentropy from the environment, as Schrödinger described [16]. In ODTOE terms: the observer must maintain $S \geq S_{\text{crit}}$ through continuous interaction with other observers and artefacts.

XII.3. The atom as an immortal observer

In [15] it is shown that the atom is an elementary strange loop in ODTOE: its self-observation Φ_{atom} is closed through quantum numbers, and each quantum state self-reproduces upon interaction with the environment. The proton lifetime is experimentally estimated as $\tau_p > 10^{34}$ years — effectively infinite compared with the age of the Universe ($\sim 10^{10}$ years).

Why is the atom (and especially the proton) effectively immortal? In ODTOE terms: the strange loop of the proton Φ_p possesses coherence $S_p \approx 1$ — nearly perfect self-consistency. This is because all four coherence components of the atom are structurally blocked from degradation:

1. F_{atom}: **focus is fixed by quantum numbers.** Quantum numbers are discrete and not subject to continuous degradation. The focus of an atom is not "attention" but a set $\{n,\ l,\ m_l,\ m_s\}$ that either exists or does not. Intermediate blurring is impossible.

2. E_{atom}: **energy levels are quantised.** An atom cannot "smoothly lose energy" — it transitions between discrete levels. The continuous decay $E \to 0$ characteristic of biological systems is forbidden by quantum mechanics.

3. $\sigma_{\text{atom}} \approx 0$: **internal contradiction is absent.** The atom's wave function is self-consistent — it is a solution of the Schrödinger equation, which is equivalent to $\sigma = 0$. The atom does not "contradict itself."

4. $\Lambda_{\text{atom}} \approx 1$: **each quantum transition confirms the structure.** Absorption and emission of photons are acts of the atom's self-observation, each of which reproduces its quantum numbers. The atom's experience is continuously renewed.

Substituting into formula (D1.1):

$$B_{\text{atom}} = F_q^{w_1} \cdot E_q^{w_2} \cdot (1 - \sigma_q)^{w_3} \cdot \Lambda_q^{w_4} \approx 1 \tag{XII.4}$$

where the subscript q emphasises the quantum (discrete) nature of each component. The atom maintains $B_{\text{atom}} > B_{\text{crit}}$ indefinitely precisely because the discreteness of quantum states does not allow continuous degradation. This is the fundamental distinction from classical (continuous) systems subject to gradual wear.

XII.4. The biological observer: why death occurs

Unlike the atom, a biological observer (cell, organism, human) operates in the domain of continuous states. Its coherence is subject to continuous degradation: DNA damage accumulates with each cell division [28], telomeres shorten [27], proteins undergo misfolding, mitochondrial function degrades.

In ODTOE terms: stochastic noise $D(\eta)$ increases with each iteration of the cell cycle because the coherence S_{bio} gradually decreases. Each division introduces a small but non-zero perturbation $\delta S < 0$ that accumulates:

$$S_{\text{bio}}(n) = S_0 - \sum_{k=1}^{n} |\delta S_k| \tag{XII.5}$$

The Hayflick limit [28] — the maximum number of cell divisions ($n_{\text{max}} \approx 50$–$70$ for human diploid cells) — sets the horizon beyond which S_{bio} falls below S_{crit} and the coherence of the biological observer becomes irrecoverable.

The cognitive coherence of a biological observer as a function of the number of iterations (cell divisions, years lived) decays exponentially:

$$B_{\text{bio}}(n) = B_0 \cdot \exp\left(-\frac{\lambda \cdot n}{S(n)}\right) \tag{XII.6}$$

where λ is the biological degradation coefficient, n is the number of iterations, and $S(n)$ is the current coherence. The formula shows that as $S(n)$ decreases, the effective degradation rate $\lambda/S(n)$ *increases* — this explains the clinically observed acceleration of ageing: the lower the coherence, the faster it continues to fall.

The fundamental reason why atoms do not die but cells do lies in the difference between *discrete* and *continuous* state spaces. An atom occupies discrete quantum states — one can "jump" from one to another only as a whole, without intermediate degradation. A cell, however, resides in a continuous configuration space where small perturbations δS accumulate like the drift of a random walk, inevitably leading to the crossing of the threshold S_{crit}.

XII.5. Five conditions for eternal life of a biological observer

From the requirement $B(t) > B_{\text{crit}}$ for all $t \in [0, \infty)$ and the structure of formula (D1.1), five necessary conditions are derived, each corresponding to a specific aspect of coherence.

Condition 1: Permanent maintenance of coherence above the threshold — $S(t) > S_{\text{crit}}$ for all t.

The observer must continuously compensate the growth of $D(\eta)$ through self-observation mechanisms. In biological terms this means continuous activation of repair mechanisms: DNA repair enzymes, antioxidant systems, autophagy. But formula (XII.2) points to a deeper level: coherence S is not a biochemical but an *informational* parameter reflecting the degree of self-consistency of the observer.

Practically: continuous self-observation (meditation), coherent breathing, mindful attention are mechanisms for maintaining $S > S_{\text{crit}}$ at the level of the whole organism. Nobel laureate Elizabeth Blackburn and her colleagues showed that meditative practices slow telomere shortening — a direct biological correlate of maintaining S [26]. Epel et al. demonstrated that meditation increases the activity of telomerase — the enzyme that restores telomeres — which in ODTOE terms is equivalent to partial compensation of $\delta S < 0$ during cell division [26].

Condition 2: Resolution of internal contradictions — $\sigma(t) < \sigma_{\text{crit}}$ for all t.

Chronic unresolved contradictions accelerate deactualisation. From formula (D2.2) it is clear that σ is determined by the degree of misalignment among the observer's subsystems. Each unresolved contradiction increases the number of pairs $(i,\ j)$ with $\cos\theta_{ij} < 0$, which increases σ and through the factor $(1-\sigma)^{w_3}$ reduces B.

The observer's lifetime is inversely proportional to the square of internal contradiction:

$$\tau_{\text{deact}} \propto \frac{1}{\sigma^2} \tag{XII.7}$$

Formula (XII.7) explains why chronic stress is so destructive: stress is the biological manifestation of high σ (misalignment between intention and reality). Cortisol, the primary stress hormone, accelerates telomere shortening [27], suppresses immune function, and accelerates neurodegeneration — all manifestations of accelerated deactualisation at high σ.

Condition 3: Continuous renewal of positive experience — $\Lambda(t)$ must not stagnate.

Stagnation of experience ($\Lambda = \text{const}$) inevitably leads to degradation, since without the inflow of new experience $d\Lambda/dt < 0$ due to the natural "weathering" of memory and diminishing emotional charge of past events. The dynamics of Λ is described by the integral equation:

$$\Lambda(t) = \Lambda_0 \cdot e^{-\mu t} + \int_0^t r(\tau)\, e^{-\mu(t-\tau)}\, d\tau \tag{XII.8}$$

where Λ_0 is the initial accumulated experience, μ is the "forgetting" rate (experience degradation rate), and $r(\tau)$ is the intensity of incoming new positive experience at time τ. The first term describes the exponential decay of past experience; the second, the contribution of continuously incoming new experience accounting for its own subsequent decay.

For maintaining $\Lambda(t) > \Lambda_{\text{crit}}$ it is necessary that the intensity of new experience $r(t)$ exceed the forgetting rate:

$$\lim_{t\to\infty} \Lambda(t) = \frac{\bar{r}}{\mu} > \Lambda_{\text{crit}} \quad \Leftrightarrow \quad \bar{r} > \mu \cdot \Lambda_{\text{crit}} \tag{XII.9}$$

where $\bar{r}$ is the average intensity of new experience. An observer who has ceased to gain new experience (a retiree without hobbies, a recluse without social contacts) has $r(t) \to 0$, and $\Lambda(t) \to 0$ exponentially — which explains the acceleration of ageing under social isolation and absence of stimulation.

Condition 4: Dynamic stability of the strange loop — $\Phi(\Psi^*) = \Psi^*$ must be dynamically stable.

The fixed point $\Psi^* = \Phi(\Psi^*)$ can be *static* (a dead point, crystallisation) or *dynamic* (a limit cycle, strange attractor). A static fixed point corresponds to rigidity — cessation of development, which inevitably leads to degradation when external conditions change. A dynamic fixed point permits renewal within a stable structure.

Formally: the observer's strange loop must include *creative deviation*:

$$\Psi^*_{n+1} = \Phi(\Psi^*_n) + \delta\Psi_{\text{creat}} \tag{XII.10}$$

where $\delta\Psi_{\text{creat}}$ is a small but non-zero deviation introduced by the observer's creative activity. Without $\delta\Psi_{\text{creat}}$ the loop closes on an exact fixed point, which is equivalent to the cessation of development and, ultimately, deactualisation: a static observer is unable to adapt to changes in the external environment.

The biological correlate: neuroplasticity — the brain's ability to form new synaptic connections throughout life. Research shows that continuous learning, acquisition of new skills, and creative activity stimulate neurogenesis in the hippocampus and maintain synaptic-connection density in the neocortex, slowing cognitive degradation.

Condition 4 can be stated more rigorously: the spectral radius of the linearisation operator $D\Phi|_{\Psi^*}$ must satisfy the inequality $0 < \rho(D\Phi) < 1$: small enough for stability but strictly positive to admit small oscillations about Ψ^*.

Condition 5: Embeddedness in a coherent community — $S_{\text{coll}} > S_{\text{crit}}$.

An isolated observer inevitably loses coherence because it is deprived of external feedback. Without interaction with other observers, stochastic noise $D(\eta)$ is not compensated and S monotonically decreases. Interaction with a coherent collective plays the role of a *coherence thermostat*: collective S_{coll} supports individual S_i through mutual synchronisation.

The lifetime of an observer embedded in a collective of n_{coll} participants with coherence S_{coll}:

$$T_{\text{life}} = \frac{T_0}{(1 - S_{\text{coll}})^{n_{\text{coll}}}} \tag{XII.11}$$

This formula is a generalisation of the configuration-lifetime formula from [1] to the case of collective support of the observer. As $S_{\text{coll}} \to 1$ and $n_{\text{coll}} \to \infty$ the denominator tends to zero and $T_{\text{life}} \to \infty$. In other words: an observer embedded in an infinitely large and perfectly coherent community lives forever.

The biological correlate: studies of "Blue Zones" — regions with anomalously high life expectancy (Okinawa, Sardinia, Nicoya, Ikaria, Loma Linda) — show that the key factor of longevity is the *quality of social bonds* [29]. In all five zones, long-lived individuals are united in close, mutually supportive communities with a high degree of mutual trust — which in ODTOE terms means high S_{coll}. Buettner [29] showed that social integration increases life expectancy by 5–14 years — an effect exceeding the individual influence of diet, physical activity, and genetics.

XII.6. The star as an observer: the condition for longevity

Stars in ODTOE are macroscopic observers [14]: thermonuclear fusion in their cores constitutes a self-observation cycle in which gravitational compression ($\hat{O}$) and radiation pressure (ι) form a closed strange loop Φ_{star}. As long as this loop is maintained, the star is "alive": $B_{\text{star}} > B_{\text{crit}}$.

Red dwarfs (mass $M < 0.5\,M_\odot$) live up to 10^{12} years — 100 times longer than the current age of the Universe. Why? Their stochastic noise $D(\eta)$ is minimal: convective mixing fully replenishes the hydrogen fuel, the thermonuclear reaction rate is low, and the coherence S_{star} remains high over trillions of years.

Massive stars ($M > 8\,M_\odot$), by contrast, live only millions of years. High luminosity means a high rate of noise generation $D(\eta)$, rapid fuel consumption, and swift decline of S_{star}. The deactualisation of a massive star — a supernova — is the analogue of instantaneous zeroing of B in severe trauma for a biological observer.

The Sun ($M = 1\,M_\odot$, $T_{\text{life}} \approx 10^{10}$ years) occupies an intermediate position. Its stellar "strange loop" is stable on a timescale of billions of years but finite: exhaustion of hydrogen in the core will inevitably disrupt the equilibrium of Φ_{star} and lead to deactualisation through the red-giant stage.

The parallel between stars and biological observers is instructive: in both cases the intensity of "life" (stellar luminosity / metabolic rate of the organism) is inversely correlated with lifespan. "To live brightly and briefly" or "quietly and long" — a dilemma fundamental to any observer in ODTOE.

XII.7. A practical protocol: approaching the conditions for eternal life

Although true biological immortality is not yet achievable, the five conditions of Section XII.5 define a concrete programme for maximally extending the observer's life. Each condition translates into a practical recommendation.

Condition 1 $\rightarrow$ Daily coherent breathing and meditation. Maintenance of $S > S_{\text{crit}}$ through mindfulness practices. Research by Epel et al. [26] showed a 30% increase in telomerase activity among meditation practitioners. Blackburn and Epel [27] demonstrated a direct link between psychological stress and telomere shortening — a biological marker of degradation of S.

Condition 2 $\rightarrow$ Resolution of contradictions through honest self-inquiry. Reduction of σ through reflective practices: journaling, psychotherapy, candid dialogue with loved ones. The Stoic practice of evening self-examination [11] is an ancient prototype of this condition.

Condition 3 $\rightarrow$ Continuous learning and new experience. Maintenance of $r(t) > \mu \cdot \Lambda_{\text{crit}}$ through active cognition: learning languages, travelling, mastering new disciplines. An observer who has stopped learning is doomed to exponential decay of Λ.

Condition 4 $\rightarrow$ Creative practice — art, science, craft. Maintenance of $\delta\Psi_{\text{creat}} \neq 0$ through regular creativity. Any form of creativity — from painting to programming, from cooking to mathematics — introduces the necessary deviation $\delta\Psi$ that prevents crystallisation of the strange loop.

Condition 5 $\rightarrow$ Active participation in a coherent community. Maintenance of $S_{\text{coll}} > S_{\text{crit}}$ through participation in groups founded on mutual respect, honesty, and a shared purpose. Blue Zone studies [29] confirm: social coherence is the most powerful predictor of longevity.

It is noteworthy that these five practices have been *independently* validated by longevity research. Residents of Okinawa, Sardinia, Ikaria, and Loma Linda display all five patterns: daily mindfulness rituals (Condition 1), low levels of chronic stress (Condition 2), active cognitive life into advanced old age (Condition 3), craft and creative activity (Condition 4), embeddedness in a close-knit community (Condition 5) [29].

XII.8. The theoretical limit: why absolute immortality is unattainable for a finite observer

Ashby's law of requisite variety asserts: for complete control of a system with n degrees of freedom, a regulator must possess no fewer than n degrees of freedom. A finite observer (atom, human, star) possesses a finite informational capacity and hence a finite number of degrees of freedom.

The environment in which the observer is embedded (the Universe) possesses, in essence, an infinite number of degrees of freedom. Therefore a finite observer is *fundamentally unable* to maintain perfect coherence $S = 1$ — this would require infinite

informational capacity. There always remains a non-zero gap $1-S>0$ and hence non-zero noise $D(\eta)>0$.

It follows that the lifetime of a finite observer can be arbitrarily large but not literally infinite:

$$\lim_{S\to 1} T_{\text{life}} = \lim_{S\to 1} \frac{T_0}{(1-S)^n} = \infty \quad \text{but} \quad S=1 \text{ is asymptotically unattainable} \qquad \text{(XII.12)}$$

The state $S=1$ — absolute coherence — is unattainable for any individual observer, just as absolute zero temperature is unattainable by the third law of thermodynamics. However, the *striving* toward $S=1$ extends the lifetime without limit.

The only "entity" for which $S=1$ is theoretically attainable is the *whole*: the totality of all observers, the fixed point Ψ^* of the Universe's self-observation [1]. Ψ^* is the sole object that is simultaneously observer and observed, and for which the cycle $\Phi(\Psi^*)=\Psi^*$ closes without remainder. Only the whole is truly immortal.

For a finite observer this means: striving toward Ψ^* (through the five conditions of Section XII.5) extends life without limit, but absolute immortality remains an asymptotic horizon — always ahead, never reached. Paradoxically, it is precisely the *impossibility* of attaining $S=1$ that creates infinite motivation for development — and thereby sustains $\delta\Psi_{\text{creat}}\neq 0$ (Condition 4), which is necessary for prolonging life.

XIII. DISCUSSION AND LIMITATIONS

1. *Ontological status of $\mathcal{H}$.* The claim that the world line W "exists" in $\mathcal{H}$ after the observer's death depends on the ontological status of $\mathcal{H}$. If $\mathcal{H}$ is an instrumentalist construct, the "existence" of W after death is a metaphor. If $\mathcal{H}$ is an element of reality (as the wave function is in realist interpretations of QM [13]) — a literal assertion. The question of the ontological status of $\mathcal{H}$ remains open and requires separate treatment.

2. *Phase order.* The order of zeroing of F, E, Λ, $(1-\sigma)$ may vary depending on the cause of death. In myocardial infarction E (the heart) is zeroed first. In dementia, Λ (memory). In trauma, simultaneous zeroing is possible. The model describes the *structure*, not a fixed sequence. Formula (D1.2) accommodates any order of zeroing.

3. *Measurability of S_A.* The coherence of an artefact S_A lacks a generally accepted measurement scale. The proposed approach (expert assessment of internal consistency) is subjective. The development of an objective metric for S_A is a necessary direction for further research. Possible approaches: citation analysis, assessment of logical consistency [24], network analysis of connections between the artefact's propositions.

4. *Limits of the analogies.* The parallels with religious teachings (Section VIII) are structural in nature and do not imply an identification of ODTOE with theology.

ODTOE is a formal system that does not require faith; religion is a system founded on faith. The coincidences suggest that religious traditions may have intuitively grasped structural patterns that are formalised in ODTOE.

5. *The problem of verifying NDE predictions.* The predictions of Section IX.2 are difficult to test rigorously: it is impossible to control the degree of decline of B during clinical death. However, retrospective analysis of NDE databases (e.g., NDERF [25]) may provide indirect evidence.

6. *Digital legacy and privacy.* The question of managing a digital legacy after the observer's deactualisation raises ethical problems beyond the scope of this paper: who has the right to manage $\mathcal{L}_{\text{digit}}(O)$ after $B_O = 0$?

XIV. CONCLUSION

Death in ODTOE is not annihilation but deactualisation. The observation operator $\hat{O}$ ceases to project configurations, but the world line W is preserved in the space of potential states $\mathcal{H}$. Biological death terminates the generation of new iterations but does not erase those that already exist.

The four phases of dying — sequential zeroing of the components of B — provide a diagnostic model linking subjective experience with the formulae of ODTOE. The differential equation (D1.2) describes the kinetics of deactualisation and predicts the cascading character of terminal degradation.

The coherent legacy $\mathcal{L}$ — the aggregate of artefacts — allows an observer's influence to survive the body. Three conditions for immortality ($S_A \to 1$, $n_{\text{succ}} \to \infty$, self-consistency with Ψ^*) determine whether a legacy will last years or millennia.

Near-death experience (NDE) receives a formal description through the expansion of the window Δn as $B \to 0$, which explains the phenomenology of "life review" and "light at the end of the tunnel." Digital legacy, despite its quantitative abundance, proves qualitatively negligible at low coherence S_A of individual artefacts.

Analysis of the conditions for eternal life without physical death (Section XII) showed that the ODTOE formalism does not prohibit observer immortality: an atom maintains $B_{\text{atom}} \approx 1$ indefinitely owing to the discreteness of quantum states. For the biological observer, five necessary conditions for maintaining $B > B_{\text{crit}}$ are derived, each of which finds independent support in longevity research. However, absolute immortality ($S = 1$) is asymptotically unattainable for a finite observer — only the whole (Ψ^*) is truly immortal.

Parallels with the Buddhist, Christian, Stoic, and existentialist traditions show that religious and philosophical teachings on death may have intuitively grasped structural patterns that are formalised in ODTOE.

The commandment "love thy neighbour as thyself" is not a moral prescription but a formula for coherent immortality: $B \to 1$ (self-love) + $S \to 1$ (love of neighbour) = $T(\mathcal{L}) \to \infty$ [3]. The only path on which T tends to infinity is the path of love. Not metaphorically. Mathematically.

CONFLICT OF INTEREST

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